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Heavy Alcohol Use is Associated with Worse Retention in HIV Care

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Abstract

Background—Poor retention in HIV care is associated with worse clinical outcomes and increased HIV transmission. We examined the relationship between self-reported alcohol use, a potentially modifiable behavior, and retention.

Methods—9,694 people living with HIV (PLWH) from 7 participating U.S. HIV clinical sites (the CFAR Network of Integrated Clinical Systems (CNICS)) contributed 23,225 observations from January, 2011 to June, 2014. The retention outcomes were 1) Institute of Medicine (IOM) retention: 2 visits within 1 year at least 90 days apart and 2) visit adherence (proportion of kept visits / (scheduled + kept visits)). Alcohol use was measured with AUDIT-C, generating drinking (never, moderate, heavy) and binge frequency (never, monthly/less than monthly, weekly/daily) categories. Adjusted multivariable logistic models, accounting for repeat measures, were generated.

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There are no conflicts of interest to disclose

Results—82% of our sample was male, 46% white, 35% black, and 14% Hispanic. At first assessment, 37% of participants reported never drinking, 38% moderate, and 25% heavy, and 89% of the patients were retained (IOM retention measure). Participants' mean (SD) visit adherence was 84% (25%). Heavy alcohol use was associated with inferior IOM defined retention (adjusted OR (aOR) 0.78, 95% CI 0.69, 0.88), and daily/weekly binge drinking was associated with lower visit adherence (aOR=0.90, 95% CI 0.82, 0.98).

Conclusions—Both heavy drinking and frequent binge drinking were associated with worse retention in HIV care. Increased identification and treatment of heavy and binge drinking in HIV clinical care settings may improve retention in HIV care, with downstream effects of improved clinical outcomes and decreased HIV transmission.

Keywords

HIV clinical care; retention; adherence; alcohol use

Introduction

The benefits of antiretroviral therapy (ART) for improving clinical outcomes and prolonging life in persons living with HIV (PLWH)[1–3] and in reducing HIV transmission to HIV-uninfected individuals[4] are well-known. To maximize ART benefit, patients must both access and remain fully engaged in HIV care. The HIV care continuum describes a series of steps necessary to achieve and maintain HIV suppression.[5–8] These steps include HIV testing and diagnosis, linkage to care, retention in care, ART prescription, ART adherence and HIV RNA suppression. Successful retention in care allows patients to reap the benefits of therapy; however, retention in care in the U.S. is suboptimal, with less than 25% of all PLWH patients' infection stably suppressed on ART, as over 50% of diagnosed persons fail to establish or remain engaged in medical care.[5]

"Heavy" or "at-risk" drinking, the quantity or pattern of alcohol use that confers increased risk for adverse health consequences,[9,10] is defined by the National Institute of Alcohol Abuse and Alcoholism as drinking > 4 drinks per day or > 14 drinks per week in men, and > 3 drinks per day and > 7 drinks per week in women. Heavy alcohol use is prevalent among PLWH[11,12] and is associated with worse antiretroviral adherence[13,14] and adverse therapeutic and clinical outcomes, including lack of viral suppression.[15] Both moderate and heavy alcohol use have been associated with increased mortality among PLWH[16–20] There are limited data on whether alcohol use influences retention in HIV care. Two large studies examining trends in retention examined the associations between multiple demographic, HIV risk factor, clinical variables, and retention, however, did not include information regarding substance use or mental health symptoms immediately prior to the retention interval.[6,21] Among studies that have examined the association between alcohol use and establishment of and/or retention in care, results have been mixed, with some studies showing a trend towards worse retention among individuals with alcohol use disorders[22] and others showing no difference.[23,24] These studies have varied in the manner in which they assess alcohol use, using medical chart abstraction[22,24] or patient self-report with the Addiction Severity Index tool.[23] They have also used different measures for retention in HIV care based on completed clinic visits[22,24] or patient's report of having an HIV doctor and/or

receiving ART.[23] Finally, heavy alcohol use has been associated with receipt of lower quality HIV care as measured by HIV quality indicators abstracted from the medical record of patients in the Veterans Aging Cohort Study (VACS).[25] One of the quality indicators was the Institute of Medicine (IOM) retention in care measure (attending at least two visits for HIV care separated by at least 90 days in a 12-month period), and heavy alcohol use was associated with worse retention in care.[26]

Several metrics based on missed and kept HIV primary care visits have been proposed to measure retention.[5,26,27] The various measures reflect different behaviors and may be influenced by different factors. The IOM retention measure, based on visits kept by patients within a year, reflects whether the patient is able to complete a minimal number of visits that would indicate continuity of care at the clinic site. The visit adherence measure, which incorporates visit "no shows," may reflect less engagement in care, and no-show visits have been associated with increased mortality.[28]

The primary aim of our study was to investigate the relationship between patient-reported alcohol use and retention in HIV care. We measured alcohol use with a standardized screening instrument to generate both heavy and binge drinking variables[29,30] and measured retention in HIV care using both the IOM retention measure and the visit adherence measure. We hypothesized that compared to no alcohol use, patient-reported heavy and binge alcohol use would be associated with worse retention in care, independent of drug use and mental health symptoms.

Methods

This was a longitudinal study of HIV-infected patients receiving primary care services at any of seven Center for AIDS Research Network of Integrated Clinical Systems (CNICS) sites, a multisite clinical cohort study of PLWH.[31]

Study Population

CNICS is a research network consisting of diverse academic clinical sites across the United States and longitudinally collects clinical data on patients living with HIV. Seven participating CNICS sites were included in this analysis: Fenway Health/Harvard University, Johns Hopkins University, University of Alabama at Birmingham, the University of California San Diego, the University of California at San Francisco, the University of North Carolina Chapel Hill, and the University of Washington. All sites have Institutional Review Board approval, and all participants at each site sign informed consent.

Inclusion Criteria

Study participants were PLWH ≥ 18 years old who completed a 10–12 minute tablet-based clinical assessment of self-reported alcohol, drug, and mental health symptoms between January, 2011 and June, 2014 (referred to as "assessment" hereafter) allowing a minimum of 12 months of follow up time. The assessment is intended to be completed by patients approximately every 6 months. For this analysis, we included all assessments with a completed alcohol instrument and we allowed for more than one assessment per patient. Our inclusion date ended in June 2014 so that we had at least one year of follow up visit data

available. We excluded observations from patients who 1) died within 1year of the assessment 2) completed an assessment but did not have a single HIV primary care visit on the day of the assessment or within a year of the assessment 3) had missing values on sex and race.

Data Source

CNICS captures clinical data for PLWH patients in care at each site, with standardized diagnosis, medication, laboratory, visit, and demographic information collected through electronic health records and other institutional data systems. Quality assessment of the data is conducted at the sites prior to data transmission and at the time of submission to the CNICS Data Management Core, and data undergo extensive quality assurance procedures after submission.[31]

Setting

The CNICS sites differ in terms of Screening, Brief Intervention, and Referral to Treatment (SBIRT) practices and practices to improve retention in care (See Table, Supplemental Digital Content 1, describing use of AUDIT-C, retention in care practices, and SBIRT practices for each site). All sites administer the AUDIT-C as part of a battery of questionnaires for research, however, some sites also make these results available to providers.

Outcomes

Following each assessment, the two primary outcomes were based on administrative records including documentation of scheduled and kept HIV primary care (not urgent care) visits. The IOM retention measure is defined as attending two or more HIV primary care visits separated by ≥90 days during a 12-month period. The visit adherence measure is defined as the proportion of kept HIV primary care visits compared to the total number of visits (kept visits/ (kept visits + scheduled visits)) during a 12- month interval.[26]

Measures of Interest

Alcohol use was assessed using the Alcohol Use Disorders Identification Test-C (AUDIT-C).[29,30] We examined alcohol use over the past 12 months two ways in our main analysis: drinking category and binge frequency category. In the drinking category, quantity and frequency of alcohol use was categorized as none, moderate (AUDIT-C score >0 and <3 for women or >0 and <4 for men), or heavy drinking (AUDIT-C score of ≥3 for women and ≥4 for men) using the first three questions of the AUDIT-C. Binge frequency was examined separately, using the third question of the AUDIT-C, which captures the frequency of binge drinking in men (binge defined as ≥5 drinks per drinking episode) and women (binge defined as ≥ 4 drinks per drinking episode) using the following categories: never, less than monthly/monthly, or daily/weekly. Binge drinking category is often a subset of heavy drinking because of the way the questionnaire is structured, however we decided to look at the two measures separately to examine whether a binge pattern of alcohol use in itself was associated with retention.

Additional covariates of interest included depressive and panic symptoms[32,33] and illicit drug use (all collected by tablet-based clinical assessment),[34,35] clinical site, race/ethnicity, age, calendar year, time from enrollment in CNICS to completion of assessment, CD4 category (≤200, 201–499, ≥500 cells/mm^3), viral load category (undetectable defined as ≤200 copies/mL) (lab values within up to 180 days in advance of or 15 days after the assessment) and a combined sex/sexual HIV transmission risk factor variable. Patient demographic characteristics (age, race, and sex) and sexual HIV transmission risk factor were collected at the time patient began care at the clinical site. Men who have sex with men (MSM) as reported sexual HIV transmission risk factor was combined with sex to form three categories: female, male (did not report MSM), and male (reported MSM). Self-reported injection drug use (IDU) as an HIV transmission risk factor was categorized as present or absent. The sex/sexual risk factor variable and IDU risk factor variable were adjusted for separately in our models. Detailed description of study variables is provided in Supplemental Digital Content 2.

Statistical Analysis

We compared demographic and clinical characteristics by drinking category using chi-square tests for categorical measures; and analysis of variance or Kruskal-Wallis test for continuous measures, as appropriate.

To examine the relationship between alcohol use and HIV retention in care we fit multivariable logistic regression models, using the IOM retention measure as a dichotomous outcome. To estimate the relationship between alcohol use and the visit adherence measure, we fit a generalized linear model (GLM) with binomial error and a logit link. In both cases we used generalized estimating equations to account for repeat measures using an exchangeable correlation structure and report robust standard errors.

In the final data including 23225 observations among 9694 unique patients, 78% had complete data. Missing data was present for alcohol binge drinking, panic and depression symptoms, illicit drug use, sex-MSM variable, IDU history, CD4 cell count and HIV RNA level. We used multiple imputation for the missing data, fitting models including all study demographic and clinical variables, and time-updated measures were lagged to the prior assessment as indicated. The final covariates in the model included drinking category or binge frequency category, current drug use, panic symptoms, depression screen, sex/sexual risk factor combination variable, age, race, injection drug use as HIV transmission risk factors, CD4 category, viral load category, enrollment date, and clinical site.

We evaluated the interaction terms generated from the combination of each alcohol variable with each mental health symptom variable.

Analyses were conducted using R Version 3.2.1 and a p-value <0.05 was considered statistically significant.

Results

A detailed description of study flow is provided in Supplemental Digital Content 3.

Table 1 displays the demographic and clinical characteristics of participants at the time of each person's initial assessment. Overall, 37% of patients reported never drinking, 38% reported moderate drinking, and 25% reported heavy drinking, while 69% reported never binge drinking, 25% reported binge drinking monthly or less than monthly, and 6% reported binge drinking daily or weekly.

The majority of participants (73%) had an undetectable viral load (≤200 copies/mL), and almost half had CD4 cell counts greater than ≥500 cells/mm^3. The majority of the participants were male (82%), 46% of participants identified as white, 35% as black, and 14% as Hispanic. Fifteen percent reported current drug use. Twelve percent of patients reported symptoms consistent with panic disorder, 14% reported some panic symptoms, and 70% reported no panic symptoms. Twenty-one percent screened positive for depressive symptoms.

Male-MSM and white participants were more likely to report moderate and heavy alcohol use in comparison to no use, with men who reported sex with men as their HIV risk factor comprising a larger proportion (73% of each group) of moderate and heavy alcohol drinkers and a lower proportion (51%) of persons with no alcohol use (51%). Similarly, a higher proportion of moderate and heavy drinkers were white (62 and 59%, respectively) compared with the proportion of non-drinkers who were white (50%). There were more current drug users in the heavy alcohol group compared to the moderate and no alcohol groups.

In the year following their first assessment, 89% of the patients were retained (IOM retention measure), and participants' mean (SD) visit adherence was 84% (25%).

IOM retention measure

Table 2 (left columns) shows the separate regression models for the IOM retention measure:. one fit with the drinking category (none, moderate, heavy) and the other fit with the binge frequency category. Heavy drinking was associated with worse retention (OR=0.78, 95% CI 0.69, 0.88). Moderate alcohol use was not significantly associated with retention in care (OR = 0.93, 95% CI 0.83, 1.03). Using binge frequency as a predictor, monthly or less binge drinking (OR= 0.89, 95% CI 0.80–0.99) was associated with worse retention compared to no binge drinking. Daily/weekly binge drinking was not significantly associated with retention in care (OR = 0.90, 95% CI 0.74, 1.10)

Current drug use was not significantly associated with worse retention for the alcohol drinking category model (OR=0.88, 95% CI 0.77, 1.00) but was significantly associated with worse retention in the binge frequency model (OR= 0.87, 95% CI 0.76, 0.99). Depressive symptoms were associated with improved retention (OR= 1.15, 95% CI 1.02, 1.30), while panic symptoms were not associated with retention.

Visit adherence measure

Table 2 (right columns) shows the separate regression models for the visit adherence measure: one fit with the drinking category (none, moderate, heavy) and the other fit with the binge frequency category. There was no association between moderate or heavy drinking and visit adherence. However, daily/weekly binge drinking was associated with worse visit

adherence (OR= 0.89, 95% CI 0.80, 0.99). The OR of 0.89 represents an 11% decrease in the odds of attending a scheduled appointment. Current drug use was associated with worse visit adherence (OR=0.74, 95% CI 0.69, 0.79 for the drinking category model and OR=0.74, 95% CI 0.70, 0.79 for the binge frequency category model). In contrast to the IOM retention measure models, panic symptoms and depressive symptoms were associated with worse visit adherence, with OR ranging from 0.85 to 0.93.

An expanded table showing the association between other demographic and clinical characteristics and the IOM retention measure and visit adherence is shown in Supplemental Digital Content 4. Of note are the associations between Black race and worse visit adherence (OR=0.63, 95% CI 0.58, 0.68 in the model with drinking categories) and the associations between higher CD4 count and worse visit adherence (OR=0.82, 95% CI 0.82, 0.92 in the model with drinking categories)

We evaluated the interaction terms generated from the combination of each alcohol variable with each mental health symptom variable and none of them were statistically significant at the level of $\alpha = 0.05$.

Discussion

Among a large sample of PLWH, alcohol use independent of both current drug use and panic/depressive symptoms was associated with worse retention in care assessed by two retention measures. Among the alcohol variables, the strongest observed association was between heavy drinking and worse retention by the IOM retention measure. Binge drinking was also associated with worse retention, but not consistently across the different retention outcomes measured and at the different levels of the binge frequency variable. Our findings imply that identifying and treating individuals with heavy and binge drinking would potentially improve retention in HIV care.

Retention in care is crucial for provision of ART. Early, consistent ART prolongs life due to decreased opportunistic infections and decreased incidence of non-AIDS related conditions.[36] Worse retention has been associated with worse clinical outcomes in multiple studies. For example, among patients in South Carolina, patients who were optimally retained after originally being linked to care had a larger decrease in viral load, increase in CD4 cells, and lower mortality.[37] A variety of retention measures have shown an association between worse retention and lower likelihood of viral load suppression.[28] Among Veterans Administration (VA) patients, worse retention, measured by number of quarters in a year with a completed visit following a new HIV diagnosis, was associated with mortality. Finally, missed visits, even among patients who appear to be retained by the IOM core indicator, have been shown to be a marker of mortality. Clearly, retention has a large role in people's overall HIV outcomes, and modifiable factors which can improve retention should be targeted for intervention.

We used multiple parameterizations of alcohol in this analysis. In a clinical setting, a commonly used alcohol instrument is the AUDIT-C, which generates both a drinking category and a binge frequency category. We were interested to see how retention outcomes

varied by classification of alcohol use. Heavy drinking was associated with worse retention by the IOM measure, suggesting an impairment of functioning among heavy drinkers who were not able to keep even two visits per year. Our finding that daily/weekly binging was associated with worse visit adherence (indicating more “no-shows”), may reflect a tendency among individuals who binge drink to miss visits because of adverse short-term consequences of their binge use, such as having a hangover. When heavy or binge drinking is detected on the AUDIT-C, it would be a signal to clinicians that the patient is at risk for worse retention, among other undesirable outcomes. Knowing that the patient is a heavy or binge drinker might compel the provider to guide patient towards services to reduce alcohol use, including brief intervention, which has been shown to be effective among women living with HIV,[38] Additional evaluation of and treatment for alcohol use disorder, with more intense counseling or pharmacotherapy, may also be warranted.

Prior studies of retention have not always captured current alcohol use,[6,21] and results regarding the alcohol-retention association have been mixed. In one study, alcohol use, captured through chart abstraction of presence or absence of alcohol use, was not significantly associated with establishing care (visit within the first 6 months of diagnosis).[22] In a VA study by Giordano et al, veterans with alcohol abuse (captured by ICD-9) were as likely to be retained (retention defined as one visit in each quarter) as those without a diagnosis of alcohol abuse.[39] In contrast, our study demonstrated a significant association between heavy and binge alcohol use and worse retention. In the VA study, the ICD-9 diagnosis of alcohol abuse indicates a diagnosis by a clinician. VA patients identified by clinicians as having alcohol abuse may have access to enhanced alcohol treatment services, which may in part explain the lack of association between alcohol use and retention in that study.

Differences between our results and those of other studies may stem from differences in how alcohol exposure was measured. In CNICS, patients participate in a self-report tablet-based assessment using the AUDIT-C. The use of this standardized instrument may identify more individuals with heavy alcohol use than medical record abstraction based on clinician documentation of patient alcohol use. Physician suspicion of heavy drinking has been shown to have a low sensitivity (27%) for detecting heavy alcohol use.[40] Moreover, self-assessment using a computer may overcome the social desirability bias that might make PLWH with alcohol use disorders reluctant to disclose their problem. In addition, the differences in retention measures among studies may also in part explain differences in study findings. Finally, our study captured individuals at various stages of their HIV care, not only people originally establishing care thus may be more generalizable to all patients in HIV care.

Our findings emphasize that retention in HIV care is affected by the presence of heavy alcohol use, independent of drug use and mental health symptoms. Clinics must enhance their capacity to identify individuals with alcohol use, drug use, and mental health disorders, and have comprehensive treatment available. Identification of these issues in real time may allow for more efficient referrals and higher uptake of substance use and mental health treatment. In busy clinics, the AUDIT-C can be administered rapidly. The AUDIT-C is in use clinically at some of the CNICS sites included in this analysis and has been incorporated

into care at Veterans Affairs clinics.[41] Retention measures can be calculated quickly from visit data to monitor both individual-level and clinic-level outcomes.

Evidence-based guidelines from a panel convened by the International Association of Physicians in AIDS Care to improve retention include substance use treatment and depression screening and treatment.[42] Enhanced personal contact between patients and clinic staff led to improvement in retention in one recent trial,[43] however, no benefit was demonstrated when patients who reported illicit drug use were analyzed separately. The authors noted that enhanced services for illicit drug users may be required to improve retention; we hypothesize that the same is true for individuals with heavy alcohol use. Screening for alcohol misuse as a preventive measure has been ranked as a grade B from the USPSTF, and the Affordable Care Act (ACA) requires coverage of preventive services graded A or B by the USPSTF.[44] The Affordable Care Act requires that insurance provided through the exchanges and by Medicaid must cover substance use disorder treatment, leading to increased availability of treatment services among those in whom a disorder is detected.[45] Additionally, substance use screening is one of the core measures for the HRSA HIV/AIDS Bureau. Despite these strong recommendations and coverage for services, alcohol screening is still not routinely performed. Strengths of our study include our large and geographically diverse sample size and our ability to capture self-reported substance use in real time using validated measures. Limitations of the study include the lack of long-term clinical outcomes and the exclusion of individuals who had an assessment but no HIV primary care visit. We were unable to determine which patients are receiving treatment for alcohol use and what impact that has on retention. Additionally, we were unable to determine if patients switched to a clinic outside of CNICS. Next, there was a small amount of missing data, which we addressed by imputing missing values when at least one variable was missing from an observation, basing these imputed variables both on prior responses by the patient (if available) and other demographic and clinical variables. In this analysis, we cannot account for the current trend in HIV practice to see stable patients less frequently, however, we limited the study period to a short time frame to minimize period effects. In addition, patients who are heavy drinkers may be less likely to complete the assessments than patients who are not heavy drinkers and those same patients may be less likely to be retained. Despite that possibility, we still found an association between alcohol and worse retention even though some heavy drinkers may not have been included. Another limitation is that we were unable to adjust for severity of medical illnesses other than HIV. An additional potential limitation is limited generalizability, as CNICS sites are may not be representative of HIV care delivery within the U.S. Prior work by Lesko et al examined whether the effect of ART on all-cause mortality determined using CNICS data was generalizable to the U.S. population living with HIV.[46] Similar effects of ART on mortality were found with the CNICS population and by extrapolating the findings to the general population living with HIV. Although we have not specifically examined the relationship of alcohol to retention using our findings extrapolated to the general population, we believe that the diversity of the clinics within the CNICS is representative of PLWH in the US overall. Also with regards to generalizability, CNICS represents a cohort of individuals generally engaged in clinical care; our generalizability is therefore limited to people who are engaged in HIV care. Even within that context, we see an effect on alcohol on retention, and we

emphasize its importance as a modifiable risk factor for worse retention. Finally, as this is a longitudinal cohort study, we are unable to account for unmeasured confounders and cannot infer causality. Our future work in this area will move beyond the association between heavy alcohol use and retention in care to examine the relationships between heavy alcohol use and both ART initiation and ART adherence.

In conclusion, we found that heavy alcohol use was associated with worse retention, independent of mental health and substance use disorders. Increased identification and treatment of heavy and binge drinking in HIV clinical care settings, by screening for alcohol use at all HIV primary care visits, may potentially improve retention in HIV care, with downstream effects of improved clinical outcomes and decreased HIV transmission.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Demographic and Clinical Characteristics of Study Sample (N=9694)

	Overall (N=9694)	No Alcohol (N=3541)	Moderate (N=3728)	Heavy (N=2425)	p-value
Sex					<0.0001
Female	17	25	12	12	
Male- MSM	65	51	73	73	
Male-Non-MSM	17	22	14	13	
Missing	1	2	1	1	
Age, years (mean ±SD)	44 ± 11	46 ± 10	43 ± 11	41 ± 11	
Race					<0.0001
White	46%	39%	50%	52%	
Black	35%	42%	32%	28%	
Hispanic	14%	15%	13%	15%	
Other/Unknown	5%	4%	5%	5%	
IDU					<0.0001
Yes	16%	22%	12%	12%	
No	82%	76%	87%	86%	
Missing	2%	2%	1%	2%	
CD4 cell category					0.02
≤200	11%	12%	11%	11%	
201–499	35%	36%	33%	36%	
≥500	48%	47%	50%	47%	
Missing	6%	5%	6%	6%	
VL Category					<0.0001
Undetectable (≤200 copies/mL)	73%	76%	74%	70%	
Detectable	22%	20%	21%	25%	
Missing	5%	4%	5%	5%	
Current Drug Use *					<0.0001
No	84%	88%	84%	76%	

	Overall (N=9694)	No Alcohol (N=3541)	Moderate (N=3728)	Heavy (N=2425)	p-value
Yes	15%	11%	15%	22%	
Missing	1%	1%	1%	2%	
Panic Symptoms					<0.0001
None	72%	75%	72%	68%	
Some	14%	12%	14%	16%	
Panic Disorder	12%	11%	12%	14%	
Missing	1%	1%	1%	1%	
Depression Screen					0.08
Negative	76%	77%	77%	74%	
Positive	21%	20%	20%	22%	
Missing	3%	3%	3%	3%	

* amphetamine, cocaine, heroin

Table 2

Association between alcohol and retention[‡]

	IOM RETENTION MEASURE		VISIT ADHERENCE MEASURE	
	Drinking Categories	**Binge Frequency Categories**	**Drinking Categories**	**Binge Frequency Categories**
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Drinking Category				
Never	Ref	Ref	Ref	Ref
Moderate	0.93 (0.83, 1.03)	--	1.01 (0.96, 1.07)	--
Heavy***	0.78 (0.69, 0.88)**	--	0.97 (0.91, 1.04)	--
Binge Frequency Category				
Never	Ref	Ref	Ref	Ref
≤ monthly	--	0.89 (0.80, 0.99)*	--	0.98 (0.93, 1.03)
Daily/weekly	--	0.90 (0.74, 1.10)	--	0.90 (0.82,0.98)*
Current Drug Use				
Yes (vs. No)	0.88 (0.77–1.00)	0.87 (0.76, 0.99)*	0.74 (0.69–0.79)**	0.74 (0.70, 0.79)**
Panic Symptoms				
None	Ref	Ref	Ref	Ref
Some	0.94 (0.83, 1.08)	0.94 (0.82, 1.07)	0.96 (0.91, 1.02)	0.96 (0.91, 1.02)
Panic Disorder	0.92 (0.80, 1.07)	0.92 (0.80, 1.07)	0.85 (0.80, 0.90)**	0.85 (0.80, 0.90)**
Depression Screen				
Positive (vs. Negative)	1.15 (1.02, 1.30)*	1.15 (1.02, 1.30)*	0.92 (0.88, 0.97)*	0.92 (0.88, 0.97)*

*p<0.05

**p<0.0001

***Heavy = AUDIT-C > 3 for women or > 4 for men

‡"Four different models were fit for each retention measure and drinking exposure type reported. Each model was adjusted for age, race, sex/sexual risk factor, CD4 category, viral load category, enrollment date, site, IVDU as HIV risk factor